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Indian Standard

EARTH-MOVING MACHINERY — TRACTOR-SCRAPERS —TERMINOLOGY AND COMMERCIAL SPECIFICATIONS

ICS 01.040.53; 53.100

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 2012 **Price Group 6**

Material Handling Systems and Equipment Sectional Committee, MED 07

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 7133 : 1994 ‘Earth-moving machinery — Tactor-scrapers — Terminology and commercial specifications’ issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Material Handling Systems and Equipment Sectional Committee and approval of the Mechanical Engineering Division Council.

This standard supersedes IS 4988 (Part 3) : 1968 ‘Glossary of terms and classification of earth-moving machinery: Part 3 Motor and towed scrappers’.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear, referring to this standard, they should be read as ‘Indian Standard’.

b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6165 : 2006 Earth-moving machinery — Basic types — Identification and terms and definitions	IS/ISO 6165 : 2006 Earth-moving machinery — Basic types — Identification and terms and definitions	Identical
ISO 6746-1 : 2003 Earth-moving machinery — Definitions of dimensions and codes — Part 1: Base machine	IS 11114 (Part 2) : 2006 Earth-moving machinery — Definitions of dimensions and codes: Part 2 Base machine (*second revision*)	do
ISO 9249 : 1997[1] Earth-moving machinery — Engine test code — Net power	IS 13116 : 2006 Earth-moving machinery — Engine test code — Net power (*second revision*)	do

The technical committee has reviewed the provisions of the following International Standards referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 3450 : 1996	Earth-moving machinery — Braking systems of rubber-tyred machines — Systems and performance requirements and test procedures
ISO 5010 : 2007	Earth-moving machinery — Rubber-tyred machines — Steering requirements
ISO 6014 : 1986	Earth-moving machinery — Determination of ground speed
ISO 6484 : 1986	Earth-moving machinery — Elevating scrapers — Volumetric ratings
ISO 6485 : 1980	Earth-moving machinery — Tractor-scraper — Volumetric rating
ISO 7457 : 1997	Earth-moving machinery — Determination of turning dimensions of wheeled machines

(*Continued on third cover*)

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[1] Since revised in 2007.

Indian Standard

EARTH-MOVING MACHINERY — TRACTOR-SCRAPERS —TERMINOLOGY AND COMMERCIAL SPECIFICATIONS

1 Scope

This International Standard establishes terminology and the content of commercial literature specifications for self-propelled tractor-scrapers and their equipment.

This International Standard applies to tractor-scrapers as defined in ISO 6165.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3450:1985, *Earth-moving machinery — Wheeled machines — Performance requirements and test procedures for braking systems.*

ISO 5010:1992, *Earth-moving machinery — Rubber-tyred machines — Steering requirements.*

ISO 6014:1986, *Earth-moving machinery — Determination of ground speed.*

ISO 6165:1987, *Earth-moving machinery — Basic types — Vocabulary.*

ISO 6484:1986, *Earth-moving machinery — Elevating scrapers — Volumetric ratings.*

ISO 6485:1980, *Earth-moving machinery — Tractor-scraper volumetric rating.*

ISO 6746-1:1987, *Earth-moving machinery — Definitions of dimensions and symbols — Part 1: Base machine.*

ISO 7457:1983, *Earth-moving machinery — Measurement of turning dimensions of wheeled machines.*

ISO 9249:1989, *Earth-moving machinery — Engine test code — Net power.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 General

3.1.1 tractor-scraper: Self-propelled wheeled machine, having an open bowl with a cutting edge positioned between the axles, which cuts, loads, transports, discharges and spreads material through forward motion of the machine.

Loading through the forward motion of the machine may be assisted by a powered mechanism (elevator) fixed to the scraper bowl. [See ISO 6165.]

3.1.2 base machine: Tractor-scraper without equipment, as described by the manufacturer's specifications, but provided with the necessary mountings to secure the attachments.

3.1.3 equipment: Set of components mounted onto the base machine to fulfil the primary design function.

3.1.4 attachment: Optional assembly of components that can be mounted onto the base machine for a specific use.

3.1.5 component: Part or an assembly of parts of a base machine, equipment or an attachment.

3.2 Masses

3.2.1 operating mass: Mass of the base machine with empty bowl, equipment specified by the manufacturer, operator (75 kg), full fuel tank and full lubricating, hydraulic and cooling systems.

3.2.2 payload: Manufacturer's rated mass that can be carried in the scraper bowl.

3.2.3 loaded mass: Sum of the operating mass and the payload loaded in accordance with ISO 6485.

3.2.4 axle distribution: Percentage of machine mass or the actual mass of each axle, empty and loaded.

3.2.5 shipping mass: Mass of the base machine with empty bowl, without operator, with full lubricating, hydraulic and cooling systems, 10 % of fuel tank capacity and with or without equipment, cab, canopy, ROPS[1] or FOPS[2], as stated by the manufacturer.

3.2.6 cab, canopy, ROPS or FOPS mass: The mass of cab, canopy, ROPS or FOPS with all their components and mountings required to secure these to the base machine.

3.3 Modes of operation

3.3.1 push-pull or dual loading: Mode of operation which allows one tractor-scraper to assist in loading another tractor-scraper by pushing or pulling through engagement devices which usually include push plates, a hook and a bail.

3.4 Performance

3.4.1 net power: (See ISO 9249.)

3.4.2 maximum travel speeds: Maximum speeds that can be obtained on hard level surfaces in each of the forward and reverse gear ratios available, with scraper bowl empty. (See ISO 6014.)

3.4.3 rimpull: Force available between the tyre and the ground to propel the tractor-scraper.

3.4.4 rimpull with direct drive transmission: Rimpull calculated or measured at the rated engine speed and at maximum engine torque in each forward speed.

NOTE 1 The maximum pull may be limited by mass and traction conditions.

3.4.5 rimpull with powershift transmission, electric drive, or hydrostatic drive: Rimpull is given by the calculated or measured pull versus machine speed curves in each forward gear range.

NOTE 2 The maximum pull may be limited by mass and traction conditions.

3.5 Steering capability

3.5.1 turning radius: (See ISO 7457.)

3.5.2 machine clearance diameter: (See ISO 7457.)

3.6 Dimensions

3.6.1 height of scraper, $H15$: Distance on Z coordinate[3] between the ground reference plane (GRP)[3] and the highest point on the scraper, with apron closed and the bowl at its highest position. See figure 1.

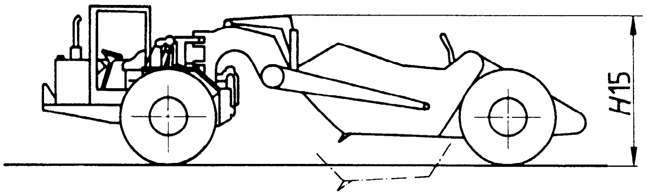

Figure 1 — Dimension $H15$

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[1] ROPS: Roll-over protective structure.

[2] FOPS: Falling object protective structure.

[3] The X, Y and Z coordinates and the GRP are defined in ISO 6746-1.

3.6.2 clearance under cutting edge in travel position, $H16$: Distance on Z coordinate between the GRP and the cutting edge with the bowl at the highest position. See figure 2.

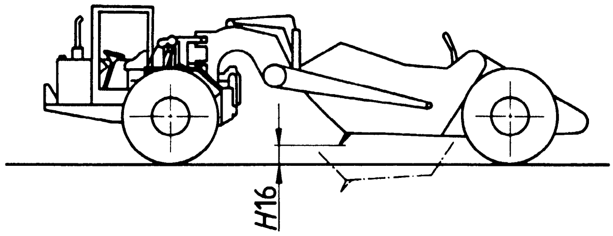


Figure 2 — Dimension $H16$

3.6.3 maximum cutting depth, $H17$: Distance on Z coordinate between the GRP and the cutting edge with the bowl at the lowest position below GRP. See figure 3.

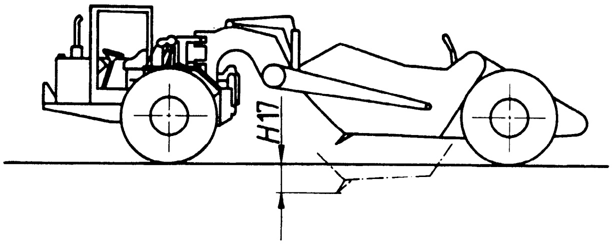


Figure 3 — Dimension $H17$

3.6.4 wheel base, $L8$: Distance on X coordinate[3] between two X planes passing through the centres of the rear wheels of the tractor and the rear wheels of the scraper when the bowl is at its highest position. See figure 4.

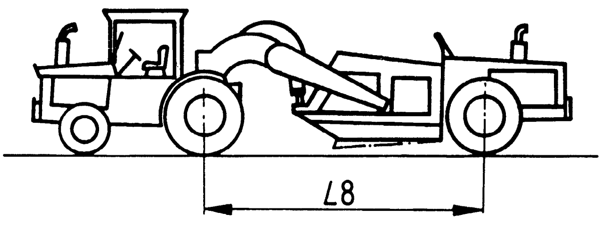


Figure 4 — Dimension $L8$

3.6.5 overall length of scraper, $L11$: Distance on X coordinate between two X planes passing through the foremost point of the tractor and the rearmost point of the scraper when the bowl is at its highest position. See figure 5.

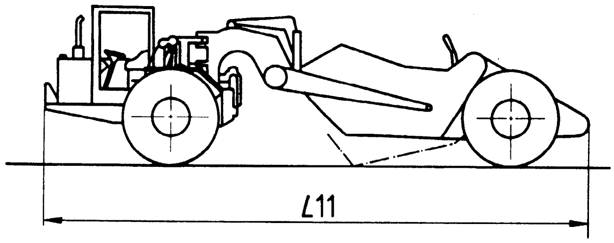


Figure 5 — Dimension $L11$

3.6.6 width of cut, $W6$: Distance on Y coordinate[3] between two Y planes passing through the furthest points of the cutting edge or side bits of the bowl. See figure 6.

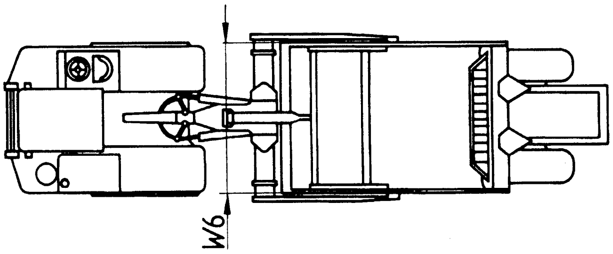


Figure 6 — Dimension $W6$

3.6.7 scraper width, $W7$: Distance on Y coordinate between two Y planes passing through the furthest points of the scraper. See figure 7.

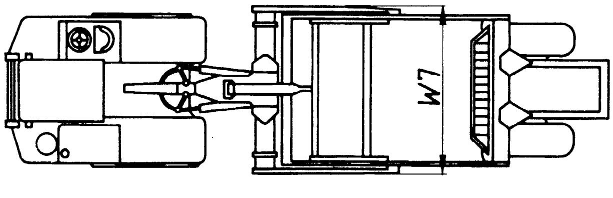


Figure 7 — Dimension $W7$

4 Base machine

4.1 Types of tractor-scrapers

Tractor-scrapers are classified according to the following attributes.

4.1.1 Method of loading

The method of loading may be:

a) open bowl loading (see figure 8), or

b) elevated loading (see figure 9).

4.1.2 Steering system

The steering system may be:

a) front wheel steer (see figure 10), or

b) articulated steer (see figure 11).

4.1.3 Number of axles

The base machine may have:

a) two axles (see figure 12), or

b) three axles (see figure 13).

4.1.4 Number of engines

The base machine may have:

a) one engine (see figure 14), or

b) two engines (see figure 15).

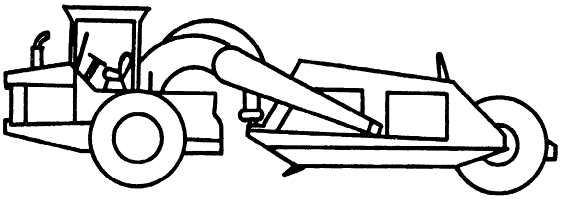
4.1.5 Drive system

The drive system may be:

a) front wheel drive (see figure 16), or

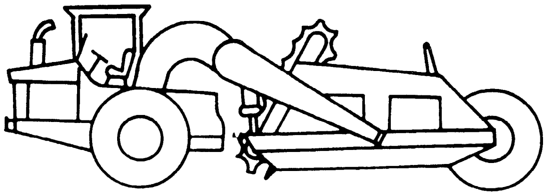
b) all wheel drive (see figure 17), or

c) centre axle drive (see figure 18).



NOTE — Open bowl scrapers require the application of tractive effort to load material into the bowl. This tractive effort may be developed by the tractor-scraper itself, by another tractor-scraper temporarily or permanently connected, or by a pushing tractor.

Figure 8 — Open bowl loading



NOTE — Elevating scrapers have a powered mechanism fixed to the scraper bowl to assist in loading material.

Figure 9 — Elevated loading

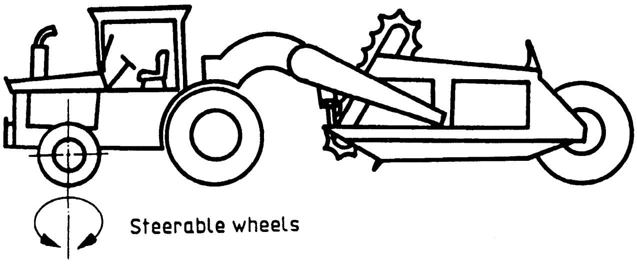


Figure 10 — Front wheel steer

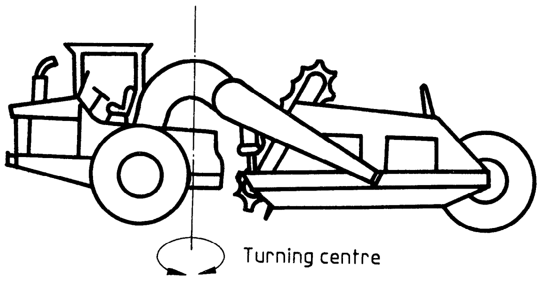


Figure 11 — Articulated steer

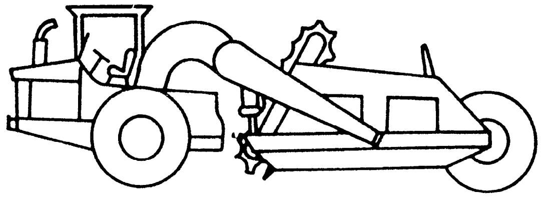


Figure 12 — Two axles

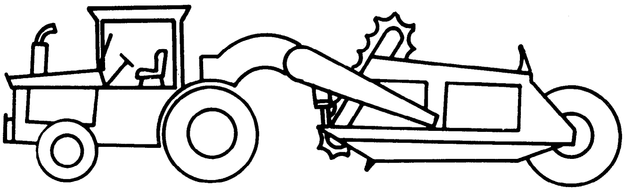


Figure 13 — Three axles

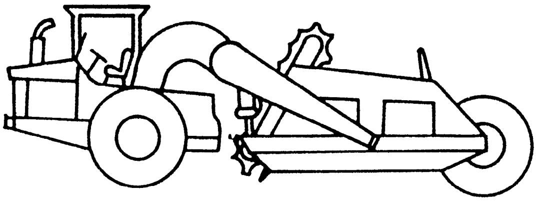


Figure 14 — One engine

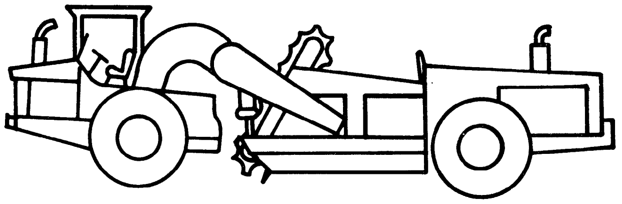


Figure 15 — Two engines

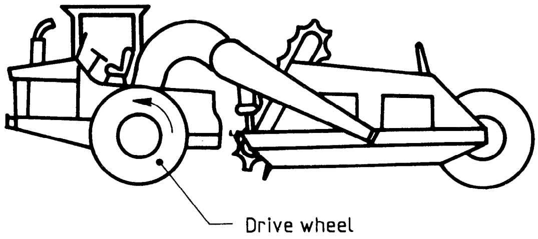


Figure 16 — Front wheel drive

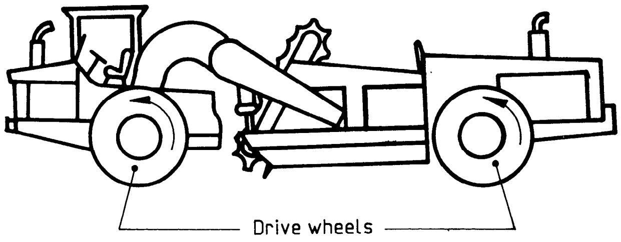


Figure 17 — All wheel drive

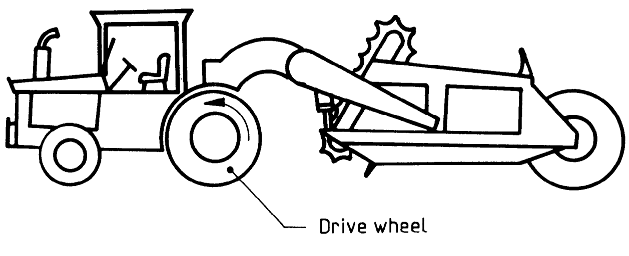


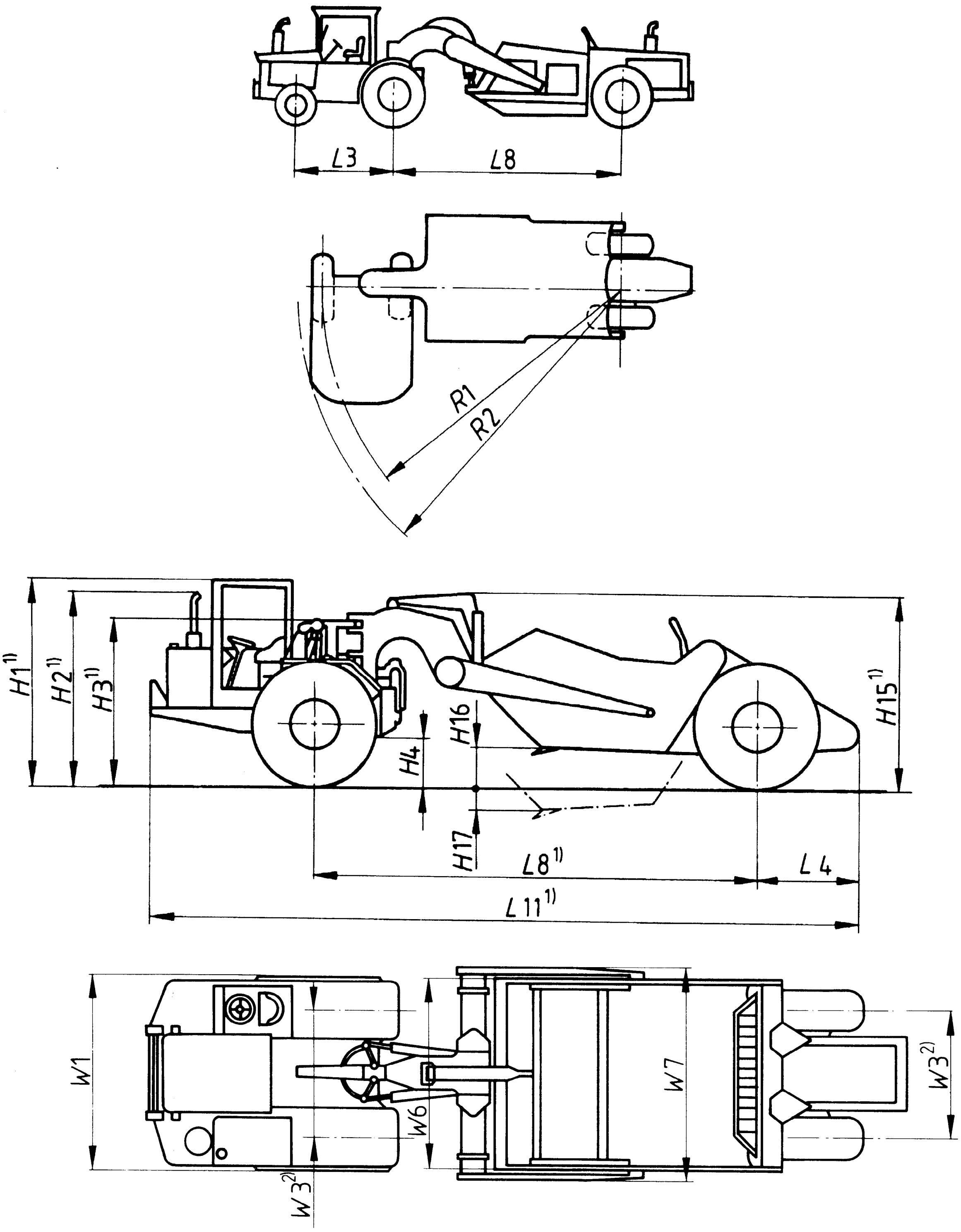
Figure 18 — Centre axle drive

4.2 Dimensions

See figure 19.

For definitions of dimensions, see ISO 6746-1.

For definitions of dimensions strictly related to tractor-scrapers, see 3.5.



1) H_1, H_2, H_3, H_{15}, L_8 and L_{11} are measured when the bowl is at its highest position.

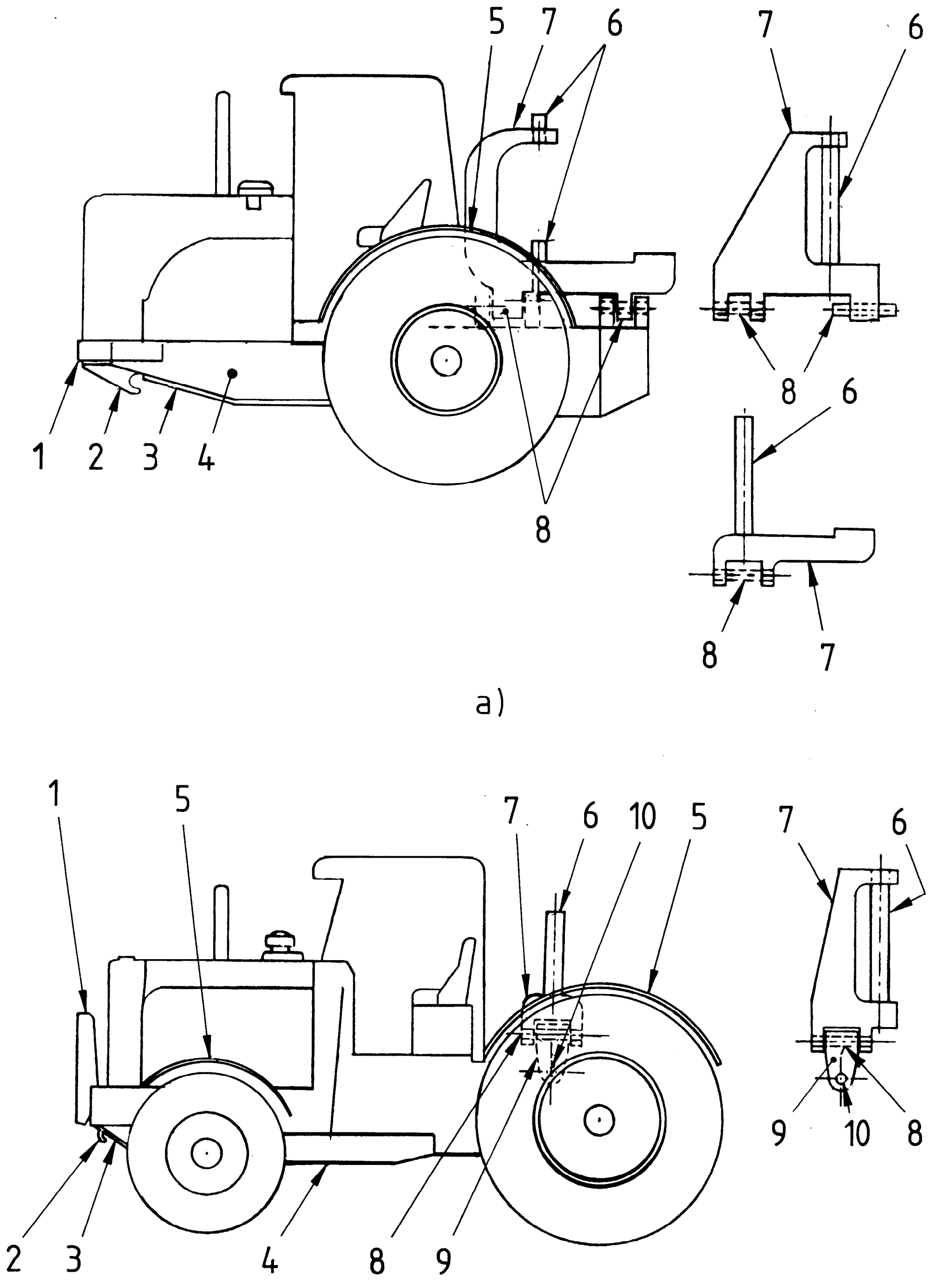
2) Wheel tread (W_3) can be different for front and rear tyres.

Figure 19 — Dimensions of base machine (tractor-scraper)

4.3 Nomenclature

4.3.1 Tractor component nomenclature

See figures 20a) and 20b) for tractor component nomenclature.



1	Bumper	6	Kingpin, hitch
2	Hook, pull	7	Hitch
3	Guard, bottom	8	Pin, oscillating pivot
4	Frame, main	9	Yoke, hitch
5	Fender	10	Pin, fore and aft pivot

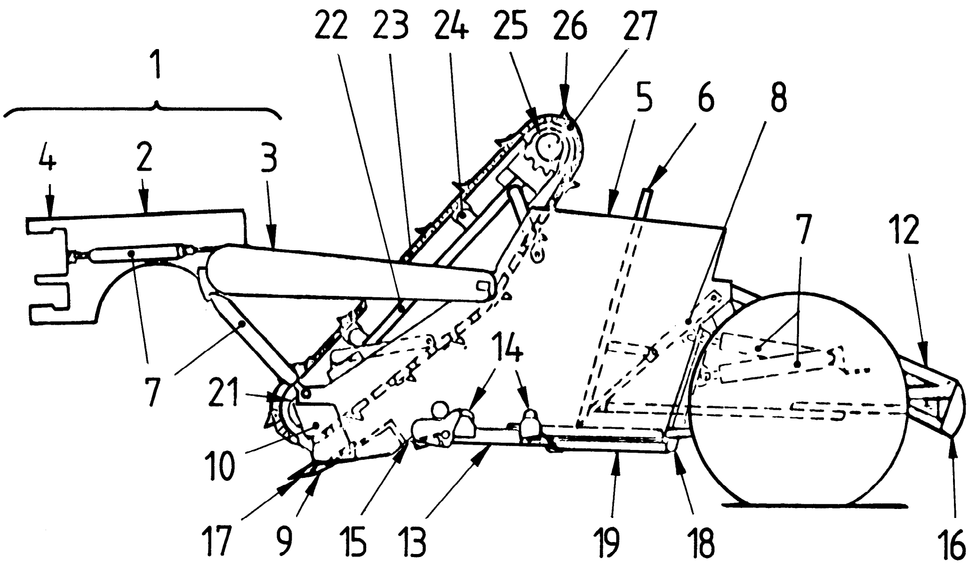
Figure 20 — Tractor component nomenclature

4.3.2 Scraper component nomenclature

See figures 21 and 22 for scraper component nomenclature.

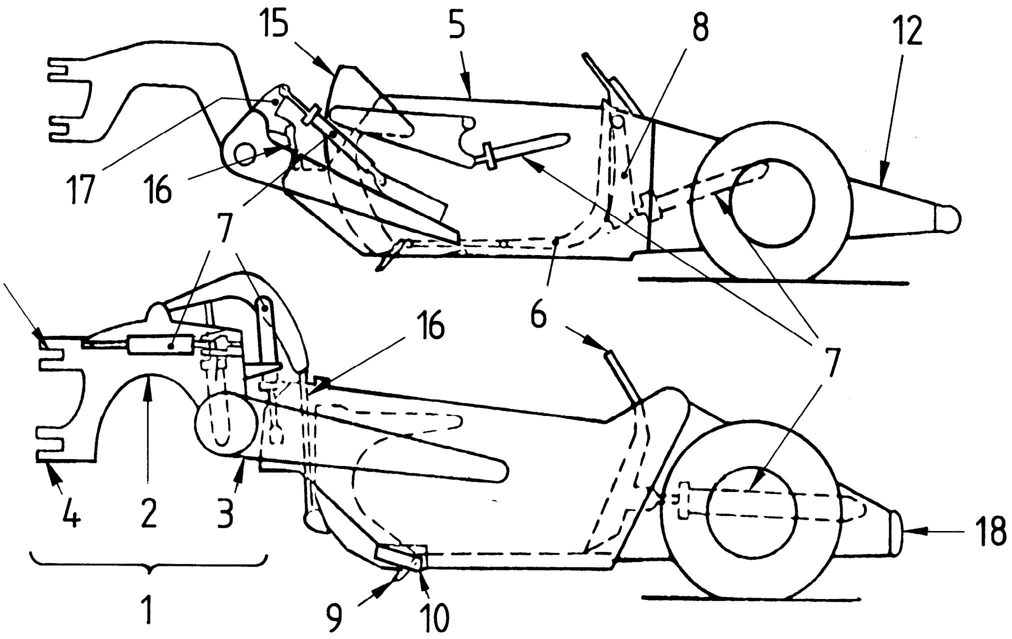
4.3.3 Attachment nomenclature

See figure 23 for attachment nomenclature.



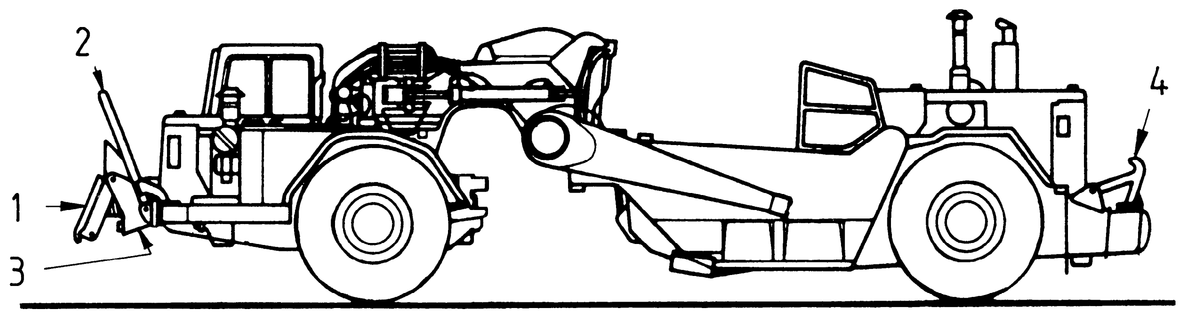
1	Frame, draft
2	Gooseneck
3	Arm, draft
4	Housing, kingpin
5	Bowl
6	Ejector
7	Cylinder
8	Lever, ejector
9	Cutting edge
10	Bit, side
12	Frame, rear
13	Floor, movable
14	Roller, floor or slide
15	Strike-off
16	Bumper
17	Tooth
18	Lever, floor
19	Link, floor
21	Idler, lower
22	Frame, elevator
23	Chain
24	Chain carrier roller
25	Sprocket, chain
26	Flight elevator
27	Drive, elevator

Figure 21 — Scraper component nomenclature for elevated loading



1	Frame, draft
2	Gooseneck
3	Arm, draft
4	Housing, kingpin
5	Bowl
6	Ejector
7	Cylinder
8	Lever, ejector
9	Cutting edge
10	Bit, side
12	Frame, push
15	Apron
16	Link, apron or bowl
17	Lever, apron or bowl
18	Plate, push

Figure 22 — Scraper component nomenclature for open bowl loading



1	Push plate, front
2	Bail nosepiece
3	Bail bearings
4	Hook

Figure 23 — Attachment and attachment component nomenclature

5 Commercial literature specifications

The following information shall be specified in commercial literature.

SI units shall be used.

5.1 Engine

The following information shall be specified:

a) manufacturer and model;

b) ignition type, i.e. diesel or spark-ignition;

c) type of cycle i.e. two- or four-stroke;

d) form of air aspiration i.e. naturally aspirated, mechanically supercharged or turbocharged;

e) number of cylinders;

f) bore;

g) stroke;

h) displacement;

i) cooling system i.e. air- or water-cooled;

j) type of fuel;

k) ISO net flywheel power at a given engine speed;

l) maximum torque at a given engine speed;

m) starter type;

n) electrical system voltage.

5.2 Transmission

The front and rear transmission types shall be specified.

EXAMPLES

Manual shift with flywheel clutch

Powershift with torque converter

Hydrostatic

Electric

Number of speeds (forward and reverse)

Maximum travel speeds (a graph of rimpull versus speed should be shown)

5.3 Drive axle(s)

The drive axle(s) type shall be specified.

EXAMPLES

Steerable

Fixed, oscillating and/or suspended

Hydrostatic

Electric

Bevel gear and pinion

Differential: standard, non-slip, lock-up

Planetary final drive

5.4 Steering

5.4.1 The type of steering shall be specified (see ISO 5010).

EXAMPLES

Articulated

Front wheel steer

Boosted, manual, hydrostatic

Power

Hydrostatic

Emergency steer method

5.4.2 The following performance information shall be specified:

a) turning radius, left and right;

b) machine clearance diameter.

5.5 Brakes

5.5.1 Service brakes

The type and actuating system of the service brakes shall be specified.

EXAMPLES

Type (drum, disc, wet or dry)

Actuating system type (mechanical, air, hydraulic, electrical, combination)

5.5.2 Parking brake

The type of parking brake shall be specified.

5.5.3 Secondary brakes

The type of secondary brakes shall be specified.

5.5.4 Retarding brake

The type and actuating system of the retarding brake shall be specified.

5.5.5 Brake performance

The brake performance shall be specified (see ISO 3450).

5.6 Tyres

The following information shall be specified:

a) size and type;

b) ply rating;

c) rim size.

5.7 Hydraulic system

5.7.1 Working pumps

The following information shall be specified:

a) type;

b) relief pressure;

c) pump flow at a given pressure, at rated engine speed.

5.7.2 Hydraulic motors

The type and function of the hydraulic motors shall be specified.

5.8 Elevated loading

The following driving type information shall be specified:

a) speed;

b) number of flights;

c) dimensions.

5.9 Bowl

The following information shall be specified (see ISO 6484 and ISO 6485):

a) rated capacity;

b) type of floor;

c) type of ejector;

d) type of apron.

5.10 Cutting edge

The size of the cutting edge shall be specified.

5.11 System fluid capacities

The following information shall be specified:

a) fuel tank;

b) engine crankcase;

c) cooling system;

d) transmission;

e) differential;

f) final drive;

g) hydraulic system.

5.12 Masses

The following information shall be specified:

a) the distribution of operating (empty) mass between

   — front axle,

   — drive axle,

   — rear axle;

b) the total operating (empty) mass;

c) the payload;

d) the distribution of loaded mass between

   — front axle,

   — drive axle,

   — rear axle;

e) the total loaded mass.

(*Continued from second cover*)

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: MED 07 (1058).

Amendments Issued Since Publication

Amendment No.	Date of Issue	Text Affected

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